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Neonatal Mortality And Its Associated Factors Among Neonates Admitted To The Nicu At Tgsh, Bahirdar, Ethiopia, 2019

Shimelis, Abebaw

NEONATAL MORTALITY AND ITS ASSOCIATED FACTORS AMONG NEONATES ADMITTED TO THE NICU AT TGSH, BAHIRDAR, ETHIOPIA, 2019.

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SHIMELIS ABEBAW, MD

PEDIATRICS RESIDENT

BAHIRDAR, ETHIOPIA

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Research Title
Neonatal mortality and its associated factors among neonates admitted to the neonatal intensive care unit at Tibebe Ghion Specialized Hospital, BahirDar, Ethiopia, 2019.

Thematic area: Pediatrics and child health

Principal investigator:
Dr Shimelis Abebaw (Pediatrics Resident, BahirDar University)
Mobile phone: +251912458579
Email Address: shimeabew@yahoo.com

Advisors:
Dr Workie Shitahun (Assistant professor, Department of pediatrics and child health, Bahirdar University)
Mr Gedefaw Abeje (Assistant professor, Department of Reproductive Health and Population Study, BahirDar University)

Abstract

Background: Neonatal period is the most vulnerable period of human life as it accounts for very high morbidities and mortalities and most of these are preventable. It is estimated that 130 million neonates are born each year and out of these, 4 million die in the first 28 days of their life, and 75% of neonatal deaths occur in the 1st week .Information on neonatal morbidity and diagnosis at initial presentation are not generally available especially in our setup; this study would be able to identify to factors associated with mortality among neonates admitted.

Continuous, surveillance on the cases, epidemiology and characteristics of neonatal admission would be very important for planning, implementing and evaluating neonatal health interventions. It can also be helpful for developing NICU admission and treatment guidelines.

Objective: To assess neonatal mortality and its associated factors among neonates admitted to neonatal intensive care unit at TGSH, Bahirdar, Ethiopia.

Methods and materials: An institution based cross- sectional study was used to identify factors associated with neonatal mortality. Five hundred forty one neonates were selected using simple random sampling methods. Appropriate data was collected using secondary data from Chart records. The cleaned data entered into & processed using SPSS program version 20. Descriptive statistics was employed to produce tabulated percentages, mean, median and range of variables. Binary logistic regression was used to measure the association between dependent & independent variables.

Results: Of 541 admitted neonates 321(59.4%) were males and 358(66.3%) were admitted at term gestational age. The neonatal mortality was 11.5%; the most common causes of death Respiratory distress syndrome (33.8%), uncontrolled sepsis (17.7%), advanced necrotizing enterocolitis (14.5%) and perinatal asphyxia (6.7%).Most neonates died in the first 3 days of life (46.7%). In multivariate logistic regression low birth weight[AOR=25.3,CI (3.2,199.8)], small for gestational age[AOR=16.9,CI (1.9, 142.8)] and low Apgar score[AOR=11.7, CI(2.06,66.1)] were the predictors of neonatal mortality.

Conclusions: Predictors of mortality were identified from this study by multivariate analysis, including weight, Apgar score, weight for gestational age, twin and triplet delivery, mode of delivery, and place of delivery. The most common causes of neonatal mortality were respiratory complication of prematurity, RDS, neonatal infections and birth asphyxia. These can be reduced by early detection and anticipating high-risk pregnancies and high-risk newborns and provision of timely and appropriate intervention.

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Table of contents

Contents

Abstract ..... - 3 -
Table of contents ..... - 5 -
ACRONYMS ..... - 7 -
1. Introduction ..... - 8 -
1.1 Back ground ..... - 8 -
1.2 Statement of the problem ..... - 9 -
1.3 Significance of the study ..... - 10 -
2. LITERATURE REVIEW ..... - 10 -
2.1 Introduction ..... - 10 -
2.2 Factors associated with neonatal outcome ..... - 10 -
2.2.1 Demographic factors ..... - 10 -
2.2.2 Neonatal factors ..... - 10 -
2.2.3 Maternal factors ..... - 13 -
3. Objectives of the Study ..... - 14 -
3.1 General objective ..... - 14 -
3.2 Specific objective ..... - 14 -
4. Methods and materials ..... - 14 -
4.1 Study design ..... - 14 -
4.2 Study Area and Period ..... - 14 -
4.3 Population ..... - 14 -
4.3.1 Source population ..... - 14 -
4.3.2 Study population ..... - 14 -
4.4 Eligibility criteria ..... - 15 -
4.4.1 Inclusion criteria ..... - 15 -
4.4.2 Exclusion criteria ..... - 15 -
Figure 1: flow chart of inclusion and exclusion criteria ..... - 15 -
4.5 Sample size and sampling technique ..... - 15 -

4.5.1 Sample Size Determination - 15 -
4.5.2 Sampling techniques - 16 -
4.6 Data collection - 16 -
4.7 Data collection technique & data collectors - 16 -
4.8 Quality control measure - 16 -
4.9 Data analysis - 16 -
4.10 Ethical consideration - 16 -
4.11 Operational definition - 17 -
4.12 Measurement variables - 17 -
4.12.1Dependent variables - 17 -
4.12.2 Independent variables - 17 -
5. Results - 18 -
5.1Demographic and neonatal factors - 18 -
Table 1: Demographics of the mother and neonatal characteristics of the study participants in TGSH,Bahirdar,Ethiopia,2019 (n=541) - 18 -
5.2. Neonatal mortality - 18 -
5.3 Factors associated with neonatal mortality - 19 -
Table 2: Factors associated with neonatal mortality in TGSH,Bahirdar Ethiopia,2019 (n=541) - 19 -
6. Discussion - 20 -
7. Conclusion - 21 -
8. Recommendation - 21 -
9. Limitations of the study - 21 -
ANNEX - 21 -
Annex One: References. - 21 -
Annex Two: Data collection sheet - 23 -

ACRONYMS

AGA- Appropriate for Gestational Age

ANC- Antenatal Care

CI- Confidence Interval

C/S-Cesarean Delivery

DC- Data Collector

EDHS-Ethiopian Demographic and Health Statics

EONS- Early Onset Neonatal Sepsis

HAI-Hospital Acquired Infection

HIE- Hypoxic Ischemic Encephalopathy

LBW-Low Birth Weight

LGA- Large for Gestational Age

LONS-Late Onset Neonatal Sepsis

MAS-Meconium Aspiration Syndrome

NICU-Neonatal Intensive Care

OR- Odds Ratio

PI- Principal Investigator

RDS-Respiratory Distress Syndrome

SGA-Small for Gestational Age

SPHMMC-St. Paul's Hospital Millennium Medical College

SPSS-Statistical Package for the Social Sciences

SVD- Spontaneous Vaginal Delivery

TGSH- Tibebe Ghion Specialized Hospital

UOG-University of Gonder

VLBW-Very Low Birth Weight EVLBW

WHO-World Health Organization

1. Introduction

1.1 Back ground

Neonatal period is a period from birth to the first 28 days of life. In this period, newborns are susceptible for many disease conditions(1).Neonatal period is the most vulnerable period of human life as it accounts for very high morbidities and mortalities and most of these are preventable. It is estimated that 130 million neonates are born each year and out of these, 4 million die in the first 28 days of their life, and 75% of neonatal deaths occur in the 1st week(2).

Neonatal morbidity and mortality continue to be a large component of the burden of disease in Sub-Sahara Africa and its rates reflect a nation's socio-economic status, the efficiency and effectiveness of health care services(3).

Now a day's neonatal mortality is declining worldwide. The worldwide neonatal mortality rates fall by 51% between 1990 and 2017 from 37 to 18 deaths per 1,000 live births. Over the same period, the number of newborn babies that died within the neonatal period declined from 5.1 million to 2.5 million. However, the burden of newborn deaths stagnated in sub-Saharan Africa. Despite the modest 41 per cent decline in the neonatal mortality rate from 2000 to 2017 in sub-Saharan Africa, the number of neonatal deaths stagnated around 1 million deaths per year due to an increasing number of births(4).

In 23 countries in sub-Saharan Africa, the number of neonatal deaths did not decline from 1990 to 2017 even though the rates of neonatal mortality fell over the same period. Sub-Saharan Africa had the highest neonatal mortality rate in 2017 at 27 deaths per 1,000 live births. Two regions account for almost 80 per cent of the newborn deaths in 2017; sub-Saharan Africa accounted for 39 per cent of all such deaths and Southern Asia accounted for 38 per cent(5).

A Neonatal Intensive Care Unit (NICU) is a specialized and organized unit of a hospital, which provides broad and persistent care for neonates who are critically ill, preterm with low birth weight (LBW) and need of attention that can benefit from such treatment and care (3).

Management of common neonatal problems requires clinical expertise, training, access to suitable equipment, and well organized referral pathways to ensure health care is of sufficient quality, which is important to monitor outcomes of care provided (1).

1.2 Statement of the problem

Neonates have low immune system, they are prone to infection and most of the illnesses they acquire usually require critical care. Neonatal infection may begin in utero, early in labor or postpartum(3).

Newborns especially those born prematurely and of low birth weight can easily became infected with harmful pathogens encountered before, during and after birth. These infection account for nearly 30% of total newborn death globally(6).

Globally, about 6.6 million children die before their 5th birthday each year. About 5 million of this occurs in the first year of life and nearly 3 million die within the first 28 days of birth. This indicates that about 44% of under-five deaths and 60% of infant deaths are accounted by the neonatal mortality(7).

Global under-five year mortality rate is 39 per 1000 live birth, of those death, 45%were newborn, with a neonatal mortality rate of 18 per 1000 live birth. Globally, an estimated 2.5 million newborns died in the first month of life in 2017 – approximately 7,000 every day – most of whom died in the first week after birth. About 36 per cent died the same day they were born, and close to three-quarters of all newborn deaths in 2017 occurred in the first week of life(4).

Neonatal mortality declined globally and in all regions but more slowly than mortality among children aged 1–11 months or children aged 1−4 years in most cases. Globally, the neonatal mortality rate fell by 51 per cent from 1990 to 2017 a smaller reduction in mortality than among children aged 1–59 months (63 per cent)(7).

In 2016, neonatal mortality in Ethiopia was 29 per 1000 live births. Every year, 120,000 die in the neonatal period. On the other hand 320,000 babies are born prematurely each year so the problem still exists. The highest mortality was seen in Amhara region,47 per 1000 live births(8).

One of the causes of neonatal morbidity is perinatal asphyxia, perinatal asphyxia is a common and serious neonatal health problem and it significant contributes to both neonatal morbidity and mortality. It has been shown that 99% of these neonatal deaths take place in the developing countries where perinatal asphyxia contributes to almost 23%of these deaths(4).

Information on neonatal morbidity and mortality at initial presentation are not generally available especially in our setup; so this study was necessary to assess neonatal mortality and its associated factors among neonates admitted.

Continuous, surveillance on the cases, epidemiology and characteristics of neonatal admission would be very important for planning, implementing and evaluating neonatal health interventions.

It can also be helpful for developing NICU admission and treatment guidelines.

1.3 Significance of the study

Identifying the causes of neonatal mortality is the key for identifying appropriate interventions for improvement of neonatal health.

Therefore, this study provides more evidence on the causes and its associated factors of mortality among neonates for health care providers. The finding of this study gives an insight to policy makers on outcome of neonates and subsequent planning and implementation of newborn health programs in the Ethiopian communities. It creates awareness for the health institution, NGOs and as a whole the society to understand about the neonatal morbidity and outcome in NICU and action to be taken to prevent it. It will be used as base line information for other researchers.

2. LITERATURE REVIEW

2.1 Introduction

Neonatal mortality is a major concern in Sub-Sahara Africa and its rates reflect a nation's socio-economic status, efficiency and effectiveness of health care services. Approximately 40% of all under – five child deaths occur in the neonatal period(4).

2.2 Factors associated with neonatal outcome

2.2.1 Demographic factors

A retrospective study in South Africa Empangeni Hospital showed that mortality was higher in males (63.2%) compared with females.(9)Similarly the study in India 2018 at tertiary care center the higher mortality was in males (62%)(10).

According to study which was done in Nigeria tertiary hospital males had higher mortality rate (57.7%).(11)Mortality rate was seen more in the male babies as compared to the female neonates (68% versus 32%) from study conducted in Nadu, India (12).

2.2.2 Neonatal factors

The most common causes of death were neonatal asphyxia (32.9%), prematurity (43%) and infection (9.8%) from study that was done in South Africa tertiary Hospital. And also the overall mortality rate was 13.8% but a higher rate of mortality (23.4%) was recorded among the referred neonates. Almost half (45%) of all deaths were found among the VLBW babies (<1,500 g). Two-thirds (67.7%) of those babies who died, were born prematurely. Over half (56.6%) of the deaths occurred within the first three days of admission(9).

The study which was conducted in tertiary care center Nadu, India 2017 showed the overall mortality rate was 10.4% and the outcome of babies born in this hospital and of the babies referred from outside. LBW deaths constitute 72% the total deaths on comparing the survival among term and preterm babies. The major causes of mortality are Respiratory syndrome 109 (33.6%), followed by birth asphyxia 82 (25.3%) and sepsis 82 (25.3%)(10).

A prospective study done in Pakistan resulted in almost 75% of neonatal deaths were attributed to three final causes: immaturity-related (26%), birth asphyxia or hypoxia (26%) and infection (23%).Congenital abnormality accounted for 8%.Almost all deaths classified as due to immaturity or asphyxia occurred during the first week of life. 54% of neonatal deaths the infant weighed < 2500 g at birth, with 87% of these low-birth-weight infants being preterm(6).

The result of the study in Jordan large government hospital showed that an overall mortality of 8.7% and those neonates who died had a median gestational age of 30 weeks. Of 321 total infants admitted to the NICU, 28 infants (8.7%) died prior to discharge. The most common admission diagnoses in infants who died were respiratory distress syndrome (86%, p = 0.046) and prematurity (75%, p = 0.019). Comparing neonates who died in the NICU to those who survived, neonates who died had a lower gestational age (30 weeks vs. 36 weeks, p < 0.001); lower median birth weight (1.2 kg vs. 2.3 kg, p < 0.001); and lower Apgar scores at one and five minutes (4 and 6 vs. 7 and 8, p < 0.001) (13).

A retrospective study done in tertiary Hospital of northern Nigeria resulted in Of the 572 neonates, 111 (19.4%) died; 64 (57.7%) males and 47 (42.3%) females giving a male to female ratio of 1.4: 1. This difference was however not statistically significant ($P = 0.24$).Prematurity was the most common cause of mortality (43.2%), followed by birth asphyxia (18.0%), neonatal infections (17.1%), and congenital anomalies (13.5%).About three quarters (76.5%) of the mortalities occurred in the first week of life with 46.4% of these occurring in the first 24 hours ($P < 0.001$)(11).

A study done in Cameroon in 2015 showed that early neonatal mortality rate was 12.6%. The average age of the deceased patients was 3 ± 2 days with a minimum of 0 and a maximum of 6 days with predominance of deaths within 72 hours following birth for 28.9%. Neonatal factors related to neonatal mortality were, low birth weight (P<0.05), hypothermia (P<0.05), Apgar score at 1 minute <7 (P <0.05), Apgar score at 5 minutes<5 (p = 0.03), the absence of immediate cry at birth (P<0.05), resuscitation at birth (P<0.05). . Preterm birth (95% CI, 1.49-304.2, OR = 21.3, P = 0.02), neonatal asphyxia (95% CI, 2.02 – 158.18, OR= 17.87, P = 0.01), respiratory

distress syndrome (95% CI, 9.28-1832.51, OR = 130.3, P = 0.0003) remained significantly associated with neonatal mortality(14).

The study conducted in rural community of Eastern Uganda showed that the neonatal mortality was found to be 34 per 1000 live births (95 % CI = 27.1–42.8); Kamuli 31.9, Pallisa 36.5 and Kibuku 30.8. Factors associated with increased neonatal deaths were newborn low birth weight (adj. RR = 3.10, 95 % CI = 1.47–6.56) and presence of newborn danger signs (adj. RR = 2.42, 95 % CI = 1.04–5.62)(15).

The results of retrospective study done in Karamara Hospital in Somali region 2017 showed that neonatal mortality rate of 5.7%. The causes of death were prematurity, suspected sepsis, meconium aspiration syndrome and respiratory distress/perinatal asphyxia which accounted for 31.1%, 24.4%, 24.4% and 20% respectively(16).

Retrospective institutional based cross-sectional study in Jimma medical center 2016 NMR was 18.48%. Place of delivery (those neonates who were out born), neonates diagnosed to have prematurity and perinatal asphyxia were identified significant predictors of neonatal death(17).

Institution based cross sectional study in Gonder University Hospital 2016 resulted in the overall mortality was 110 (14.3%; 95% confidence interval [CI]: 11.9–16.9) of which 69(62.7%) deaths occurred in the first 24 hours of age. mortality was significantly associated with perinatal asphyxia (AOR: 5.97; 95% CI: 3.06–11.64) and EONS (AOR: 2.66; 95% CI: 1.62–6.11). Mortality was also higher in preterm GA <34 wks. (28.9%), RDS (51.2%), LBW (21.1%) and neonates having severe hypothermia (71.2%)(5).

A prospective study done in St. Paul's Hospital Millennium Medical College, Addis Abeba showed that the overall mortality in our neonatal care unit was 50/216 (23.2%). Out of the 216 neonates studied, 50 (23.2%) died. High case fatality was observed among neonates with the diagnosis of prematurity with respiratory problem (40.5%) and asphyxia (40.0%). Under multivariate analysis, diagnosis of asphyxia was an independent predictor of mortality (adjusted odds ratio =5.817; 95% confidence interval: 1.611–20.977), while gestational age above the mean of the study population (36.6 weeks) was protective of mortality (adjusted odds ratio =0.683; 95% confidence interval: 0.588–0.795)(18).

The study that was conducted in FHRH, Amhara Region in 2016 showed that the overall NMR at this Hospital was 13.29 percent. Early age of the newborn (< 7 days) [AOR = 0.39 (0.16–0.97)], gestational age at delivery [AOR = 2.14 (1.0–4.52)], late initiation of breastfeeding [AOR = 2.89 (0.99–8.38)], nonexclusive breastfeeding [AOR = 6.77 (3.04–15.07)], inadequate antenatal visit [AOR = 5.02 (1.02–24.70)] were the determinant factors for neonatal death. Among the common diseases identified as a causes of neonatal mortality: pneumonia (5.13%), sepsis (9.68), congestive heart failure (33.33), jaundice (16.67), premature delivery (34.69) and other unidentified causes (9.84%) (19).

2.2.3 Maternal factors

A prospective study done in Pakistan resulted in obstetric factors associated with neonatal death were: preterm labor (34%), intrapartum asphyxia (21%), antepartum hemorrhage (9%), infection (4%), congenital abnormality (4%) and intrauterine growth retardation (2%). No obstetric cause was found in 19% of cases(6).

Whereas a study conducted in Cameroon in 2015 showed lack of association between maternal factors and early neonatal mortality. Similarly, no maternal history was associated with this mortality, which was also the case for factors related to childbirth(14).

The study conducted in rural community of Eastern Uganda resulted in Factors associated with increased neonatal deaths were parity of 5+ (adj. RR =2.53, 95 % CI =1.14–5.65) relative to parity of 4 and below. Factors associated with lower risk of neonatal death were, home visits by community health workers' (CHW) (adj. RR =0.13, 95 % CI = 0.02–0.91), and attendance of at least 4 antenatal visits (adj. RR = 0.65, 95 % CI = 0.43–0.98)(15).

According to the results of study of NMR and its trends in Ethiopia, 1995-2010 neonates born to mothers aged < 18 years (HR = 1.41; 95% CI, 1.15 − 1.72); and those born within 2 years of the preceding birth (HR = 2.19; 95% CI, 1.89 − 2.51). Giving two Tetanus Toxoid Injections (TTI) to the mothers before childbirth decreased neonatal mortality risk (HR = 0.44; 95% CI, 0.36 − 0.54). Neonates born to women with secondary or higher schooling vs. no education had a lower risk of dying (HR = 0.68; 95% CI, 0.49 − 0.95)(20).

3. Objectives of the Study

3.1 General objective

To assess neonatal mortality and its associated factors among neonates admitted to neonatal intensive care unit at TGSH, BahirDar, Ethiopia, from January to September 2019.

3.2 Specific objective

1. To determine mortality of the neonates admitted into NICU at TGSH, BahirDar, Ethiopia.
2. To identify associated factors of neonatal mortality admitted into NICU at TGSH, BahirDar, Ethiopia.

4. Methods and materials

4.1 Study design

Hospital based retrospective cross sectional study was conducted to assess neonatal mortality and associated factors among neonates admitted to the neonatal intensive care unit TGSH, BahirDar, Ethiopia, 2019.

4.2 Study Area and Period

The study was conducted in TGSH, Bahirdar University, Bahirdar that is found 565 km North West of Addis Abeba. The hospital is located in Bahirdar zuria about 7 KM far from the city. The hospital has started its function on January 2019.It provides service in departments like pediatrics and child health, internal medicine, surgery , gynecology/obstetrics and orthopedics ; has other clinical departments like, dentistry, ophthalmology, psychiatry, anesthesia, and dermatology.

The NICU has about 2 admission rooms (one for term and the other for preterm neonates), 3 maternal room, 27 beds, 3 incubators, 4 radiant warmers, 7 phototherapy and oxygen cylinders and concentrators. It has also 2 pediatricians, 5 residents, 8 interns and about 23 nursing staffs working in rotation.

The study was conducted from November1-30 2019.

4.3 Population

4.3.1 Source population

All neonates who came to NICU at TGSH, BahirDar Ethiopia from January to September 2019.

4.3.2 Study population

All neonates who were admitted NICU at TGSH, BahirDar Ethiopia from January to September 2019.

4.4 Eligibility criteria

4.4.1 Inclusion criteria

All medical record cards with full information were included

4.4.2 Exclusion criteria

Lost cards, incomplete cards and against medical advice was excluded from the study.

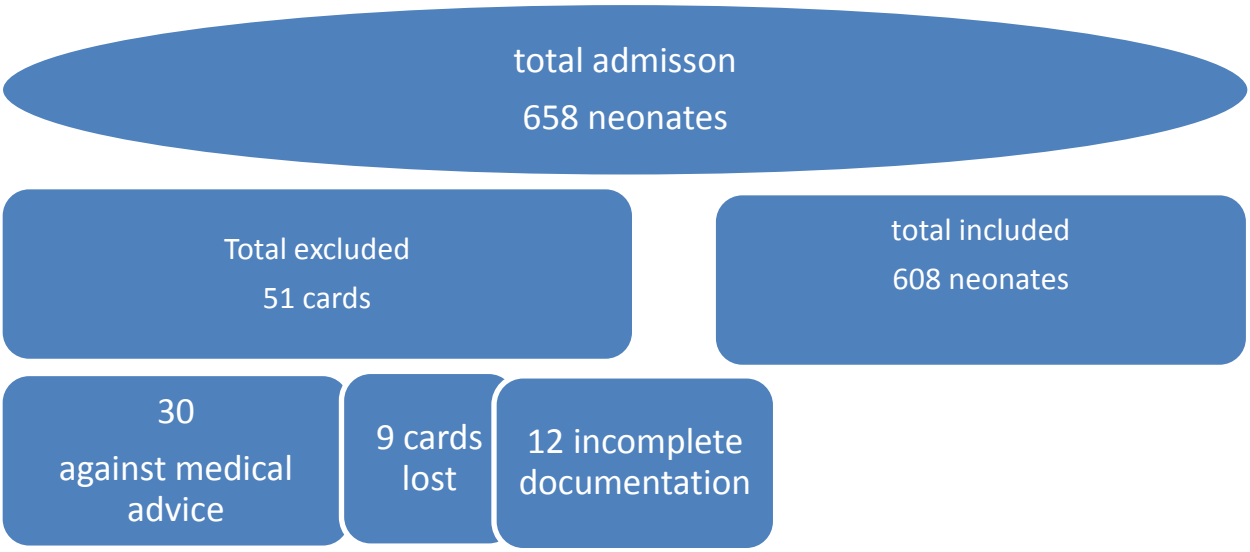

Figure 1: flow chart of inclusion and exclusion criteria

4.5 Sample size and sampling technique

4.5.1 Sample Size Determination

The sample size was determined by using single proportion formula with the following assumptions; CI taken as 95%, P as 13.89% from previous study (19) and marginal error 5%.

$n = Z2\ p\ (1-p) / w2$

Where, n- Required Sample size

z- Standard normal value at 95% CI

p- Estimated population proportion

w- Possible margin of error tolerated

$n = 1.96^2 \times 0.1329(1-0.1329)/ (0.03)^2$

n =493

By adding non-response rate with 10%, it became 541.

4.5.2 Sampling techniques

From the sampling frame, the registration book, simple random sampling (lottery method) was used to select the samples.

4.6 Data collection

Data were collected using checklist from TGSH NICU registration charts. The checklist was prepared by reviewing existing literature.

4.7 Data collection technique & data collectors

A trained nurse collected the data from the records that took about 2 weeks by using the prepared checklist.

4.8 Quality control measure

The collected data were checked for completeness, accuracy and clarity by the principal investigator. If any incompleteness was seen, it was corrected as soon as possible before feeding the data into computer and analyzing it. To evaluate the validity and reliability of the data pre-test was done on approximately 5% of the sample size before the actual data collection procedure, so the necessary readjustment or modifications on the tool would be made.

4.9 Data analysis

The collected data were coded, filtered and entered in to Microsoft excel 2010 and transferred to SPSS program version 20 for analysis. Descriptive statistics was employed to produce tabulated percentages, mean, median and range of variables.

To identify factors associated with neonatal mortality, first bivariate analysis was done to each independent variable with the dependent variable. Those variables with p-value < 0.2 in the bivariate logistic regression analysis were included in the multivariate logistic regression analysis. The strength of association was determined using odds ratio and 95% confidence level. Statistical significance was stated at P value of < 0.05.

4.10 Ethical consideration

Before data collection, ethical clearance was obtained from ethical and research committee of BahirDar University. All information kept confidential.

4.11 Operational definition

- NMR –the probability of dying in the first 28 days of birth per 1000 live births
- Preterm – neonates born <37 weeks of gestation
- Term –neonates born b/n 37weeks and 42 weeks of gestation
- Post term- neonates born above 42 weeks of gestation
- SGA- Birth weight less than 10th percentile for that particular gestational age.
- AGA- Birth weight b/n 10th percentile for that particular gestational age.
- LGA- Birth weight greater than 10th percentile for that particular gestational age.
- NBW-Birth weight b/n 2500 gm. and 4000 gm.
- LBW- Birth weight b/n 1500 gm. And 2500 gm.
- VLBW- Birth weight b/n 1000 gm. And 1500 gm.
- EVLBW- Birth weight less than 1000 gm.
- Macrosomia – Birth weight greater than 4000 gm.
- EONS-Neonatal sepsis before 7 days.
- LONS- Neonatal sepsis above 7 days.

4.12 Measurement variables

4.12.1Dependent variables

- Outcome of the neonate (Death and Discharged)

4.12.2 Independent variables

- Age (gestational age)
- Sex of neonate
- Clinical diagnosis
- Length of stay
- Cause of death
- Time of death
- Mode of delivery
- Apgar score
- Place of birth
- ANC follow up
- Socio demographic factors of the mother
    - Age of mother, Residence ,Parity

5. Results

5.1Demographic and neonatal factors

Of 541 admitted neonates 321(59.4%) were males and 358(66.3%) were admitted b/n 37-41+6 weeks of gestation.

Most of neonates were singleton (91.9%) ,normal birth weight (68%) and appropriate for gestational age(95.4%).The place of delivery was at Hospital in 95.5% of newborns. In 507(93.9%) of neonates the mode of delivery was by vaginal delivery.

Table 1: Demographics of the mother and neonatal characteristics of the study participants in TGSH,Bahirdar,Ethiopia,2019 (n=541)

Variables		Frequency	Percentage
Sex	Female	210	40.6
	Male	321	59.4
GA INWEEKS	28-33+6	70	13.0
	34-36+6	93	17.2
	37-41+6	358	66.3
	≥42	19	3.5
Wt. AT BIRTH	500-999	5	0.9
	1000-1499	39	7.2
	1500-2499	119	22.0
	>2500	368	68.0
	>4000	10	1.9
Single or multiple	Singleton	497	91.9
	Twin	39	7.2
	Triplet	5	0.9
Wt. For GA	AGA	516	95.4
	SGA	13	2.4
	LGA	12	2.2
APGAR score	<3	2	0.4
	b/n 4-7	17	3.1
	>7	342	63.1
	Unknown	180	33.3
Place of delivery	Hospital	518	95.9
	health center	22	4.1

5.2. Neonatal mortality

The neonatal mortality was 11.5%.The most common causes of death RDS (33.8%), uncontrolled sepsis (17.7%), advanced NEC (14.5%) and perinatal asphyxia (6.7%).Most neonates died in the first 3 days of life (46.7%). Death occurred in newborns who were having GA less than 34 weeks (61%), weight less than1500 gm. (47.6%) and Neonates born from primipara (53%).

5.3 Factors associated with neonatal mortality

The associations of the independent and dependent variables were first tested by using bivariate analysis. Variables that were associated ($p < 0.2$) in the bivariate analysis were tested in the final multivariate analysis to see their significant association with neonatal mortality. In the bivariate analysis GA, weight, Apgar score, weight for gestational age, twin and triplet delivery, mode of delivery, and place of delivery had significant association with neonatal mortality.

Where as in multivariate logistic regression weight, Apgar score, weight for gestational age, twin and triplet delivery, mode of delivery, and place of delivery were the predictors of neonatal mortality.

LBW was significantly associated with the neonatal mortality. Those newborns weight less than 1500gm had 25.3 times higher odds to die than normal birth weight neonates[AOR=25.3,CI (3.2,199.8)].Neonates born as small for gestational age had 16.9 times higher probability of dying than appropriate for gestational age [AOR=16.9, CI (1.9, 142.8)].

Apgar score had also significant association with neonatal mortality. Those newborns who were having Apgar score less than 7 were 11.7 times more likely to die than Apgar greater than 7 [AOR=11.7, CI(2.06,66.1)] .

Neonates who were born by C/s had 20.6 times high probability of dying compared with neonates delivered by vaginal delivery [AOR=20.6, CI (6.0, 70.6)].Place of delivery was also one of the determinant factors of neonatal mortality. Newborns delivered at health center had 19.8 times more probability of dying than those delivered at hospital [AOR=19.8, CI (5.5, 71.1)].

Table 2: Factors associated with neonatal mortality in TGSH,Bahirdar Ethiopia,2019 (n=541)

Variables		Neonatal mortality		P. value	COR(95% CI)	P .Value	AOR(95%CI)
		No	yes				
Sex	Female	195	24	0.753	1.09(0.63,1.88)		
	Male	283	38		1.00		
GA	28-33+6	38	32	<0.001	22.4(11.5,43.7)	0.242	2.9(0.48,17.4)
	34-36+6	88	5	0.892	1.07(0.3,2.9)	0.351	0.4(0.06, 2.7)
	≥42	340	18	0.964	1.04(0.1,8.3)	0.465	0.1(0.001,27.2)
	37-41+6	18	1		1.00		
WT AT BIRTH	<1500	14	30	<0.001	48.34(21.5,108.5)	0.002	25.3(3.2,199.8)
	1500-2499	103	16	<0.001	3.51(1.7,7.2)	0.155	3.3(0.6,17.3)
	>2500	361	16		1.00		
Single or multiple	Singleton	451	45		1.00		
	Twin & Triplet	27	17	<0.001	6.31(3.2,12.5)	0.008	4.9(1.5,15.9)
Wt. for GA	AGA &LGA	474	53		1.00		
	SGA	4	9	<0.001	20.12(5.9,67.5)	0.010	16.9(1.9,142.8)
APGAR score	<7	4	15	<0.001	57.14(17.4,187.4)	0.005	11.7(2.06,66.1)
	Unknown	154	26	0.002	2.57(1.4,4.7)	0.001	4.9(1.9, 12.9)
	>7	320	21		1.00		
Place of	Hospital	466	52		1.00		

delivery	health center	12	10	<0.001	7.47(3.1,18.1)	<0.001	19.8(5.5,71.1)
Parity	PRIMI	296	33		1.00		
	MULTI	182	29	0.188	1.43(0.8,2.4)	0.101	2.1(.9,5.1)
Residence	Urban	210	22		1.00		
	Rural	268	40	0.208	1.42(.8, 2.4)	0.013	0.3(0.1,0.8)
Maternal complication	Yes	1	21	<0.001	244.3(32.0,1862.6)	<0.001	181.7(14.8,2219.3)
	No	477	41		1.00		
Mode of delivery	C/s	10	23	<0.001	27.60(12.3, 62.1)	<0.001	20.6(6.0,70.6)
	Vaginal delivery	468	39		1.00		

6. Discussion

This study was attempted to determine neonatal mortality rate and identify associated factors with neonatal mortality.

The prevalence of neonatal mortality was 11.5% at Tibebe Ghion Specialized Hospital. This was relatively lower than 14.7% in Gonder, 13.29% in FHRH, 23.2% in Saint Paul Hospital and in other developing countries. (5, 18, 19).In contrary lower mortality of 6.2 % and 4.6% were also reported in Pakistan and Nepal studies, respectively.(6, 21). The discrepancy observed between the mortality rates estimated by several centers and countries might be due to the difference in the distribution of skilled human resources, quality of care delivered by the centers, equipment availability, and socioeconomic status.

Most of the deaths occurred in the first 72 hours of birth (46.7%) which is in line with study in SPHMMC (68%) and other centers and countries.(18) In other studies, it was in the first 24 hours most of the death occurred.(5, 11, 22).

The most common causes of death were RDS (33.8%), neonatal sepsis (17.7%), NEC (14.5%) and perinatal asphyxia (6.7%).The result was in line with studies done in UOG, Saint Paul Hospital, northern Ethiopia, Nigeria, South Africa and India (5, 9, 11, 18, 23). Sepsis occurs because of colonization of the neonate by bacteria in utero or after birth. This can be prevented by appropriate treatment of maternal infection and by proper infection prevention strategies during labor and delivery or after delivery. Asphyxia is a neonatal problem that can be prevented and should be prevented, but once it occurs, reversing the damage to body organs may not be possible. Proper training of the health care provider on how to detect fetal jeopardy during labor and delivery and on how to identify risk factors for asphyxia can help prevent asphyxia. Providing training on neonatal resuscitation to health care providers who attend labor and delivery is also very important in preventing asphyxia. Addressing some of the factors, which can lead to premature labor, could help to arrest preterm delivery.

In multivariate logistic regression, the determinants of neonatal mortality were low birth weight, small for gestational age and low Apgar score, which were in line with studies in UOG, India and Pakistan.(5, 6, 10)

These indicated that most of the neonatal deaths are due to preventable causes of death that could be addressed by anticipating risky pregnancies and the provision of proper and on time interventions.

Cesarean delivery was also one of the predictors of neonatal mortality. [AOR=20.6, CI (6.0, 70.6)] as compared to vaginal delivery which was in line with studies in Mexico and US.(24) The excess of mortality could not be explained by the effect of maternal characteristics or complications or by differences in birth weight or gestational age. It is suggested that the conditions under which the operation was performed probably explain the increased risk of early neonatal death.(24)

7. Conclusion

The neonatal mortality at TGSH was 11.5%.Predictors of mortality were identified from this study by multivariate analysis, including low birth weight, small for gestational age and low Apgar score as well as the causes of neonatal mortality respiratory complication of prematurity, RDS, neonatal infections and birth asphyxia.

8. Recommendation

The causes and predictors of neonatal mortality were preventable and could be reduced by increasing work on preventive measures at ANC follow up to detect high-risk pregnancy and for timely intervention. Without improved quality, increased health-care coverage is unlikely to substantially improve perinatal and neonatal outcomes.

To decrease neonatal mortality from major preventable causes of death, it is required to have standard care in terms of adequate training for nurses as well as physicians, adequate resources, including equipments and medications, are all factors that contribute to neonatal deaths.

To identify other factors and to increase the validity of the results, it is better to continue the study with different study design.

9. Limitations of the study

As this is a retrospective cross-sectional study, cause–effect relation could not be analyzed. In addition, due to heavy rush in the neonatal ward, paper charts may not be complete for some of the cases. Another limitation is that some of the variables mentioned in the multivariate model had wide CIs and high odds ratio that may undermine the efficacy of this study.

ANNEX

Annex One: References.

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Annex Two: Data collection sheet

NEONATAL MORTALITY AND ITS ASSOCIATED FACTORS AMONG NEONATES ADMITTED TO THE NEONATAL INTENSIVE CARE UNIT AT TGSH, BAHIRDAR, ETHIOPIA, 2019

DATA COLLECTION SHEET:

PATIENT DATA

Date …….

Patient ID number…… Study number ……..

Age … Sex 1) Female… 2) Male…

1. Gestation age in weeks at birth

A. <29 B. 30-33 C. 34-37 D. >37 E. >42

2. Weight at birth (g)

A. 500 – 999 B. 1000 – 1499 C. 1500 – 2499 D. >2500

3. Singleton, twin or triplet

1. Singleton

2. Twin

3. Triplet

4. Weight for height at birth

A. Adequate for gestation age (AGA)

B. Small for gestation age (SGA)

C. Large for Gestation age (LGA)

5. Mode of delivery

A. Spontaneous vaginal delivery

B. caesarian section

c. Instrumental delivery

6. APGAR score at birth (minutes) 1. <7 2.≥7 3.unkown

7. Resuscitation done at birth

A. No B. Yes C. unknown

8. Place of delivery

A. Home delivery

B. Hospital delivery

C. Health Center

9. Parity of mother

1. Primipara

2. Multipara

10. Residence

1. Urban

2. Rural

11. Maternal age

1. <18 years

2.18-34 years

3. ≥35 years

12. Maternal disease or complication during pregnancy

1. Chorioamonitis

2. Preeclampsia

3. Gestational DM

4. Obstructed labor

5. Others

6. No

13. Chronic maternal disease

1. Hypertension

2. Diabetes mellitus

3. Cardiovascular disease

4. Others

5. No

14. Admitted to NICU from

A. labor ward from FHRH

B. Referred from other hospital

c. Came from home

15. Admission diagnosis

1. …….

2. …….

3……..

16. Length of stay

A. birth up to 24 hr

B. 24 hr – 3 days

C. 4 days – 7 days

D. >7 days

17. Outcome

1. Discharged Improved
2. Death

18. Age at the time of death

A. <24 hours

B. 24 –72 hours

C. Within first week of life

D. > first week of life

3. Immediate cause of death

1……

2……

3……